CLAIMS

1. A polarization converter for use with a light source that generates a light beam having at least two light components, comprising an optics array capable of separating said light beam into at least one light component polarized differently than another light component.

2. The converter of claim 1 wherein said light source defines an initial étendue and said optics array has an étendue no more than four times greater than said initial étendue.

3. The converter of claim 2 wherein said optics array has an étendue no more than 3.5 times greater than said initial étendue.

4. The converter of claim 2 wherein said optics array has an étendue no more than two times greater than said initial étendue.

5. The converter of claim 1 wherein said optics array has at least one dichroic filter.

6. The converter of claim 1 wherein substantially all of said light beam is transmitted through said optics array.

7. The converter of claim 5 wherein said dichroic filter is sandwiched between two quarter waveplates.

8. The converter of claim 1 wherein said optics array has a first dichroic filter and a second dichroic filter complimentary to said first dichroic filter.

9. The converter of claim 8 wherein each dichroic filter is sandwiched between two quarter waveplates.

10. The converter of claim 8 wherein said optics array includes a polarizing beam splitter and said light beam passes through said beam splitter before passing through one of said dichroic filters.

11. The converter of claim 10 wherein said optics array further includes another polarizing beam splitter.

12. The converter of claim 9 wherein said optics array further includes two polarizing beam splitters and each of said dichroic filters is between each of said beam splitters.

13. The converter of claim 12 wherein said optics array further includes a halfwave plate between one of said polarizing beam splitters and an illuminated object.

14. The converter of claim 1, further comprising a plurality of light input ports.

15. The converter of claim 9 wherein said optics array further includes a first polarizing beam splitter between said light source and said first dichroic filter, and a second polarizing beam splitter between said first polarizing beam splitter and said second dichroic filter.

16. The converter of claim 9 wherein said optics array further includes a stack of polarizing beam splitters, said dichroic filters are adjacent to one another and are located on one side of said stack of beam

splitters, and said optics array further comprising a plurality of quarter waveplate and mirror stacks located on the other side of said stack of polarizing beam splitters, said dichroic filters and said quarter waveplate and mirror stacks arranged so that at least a portion of one of said dichroic filters opposes a portion of one of said quarter waveplate and mirror stacks, and at least a portion of another of said dichroic filters does not oppose any of said quarter wave plate and mirror stacks.

17. The converter of claim 1 wherein said light source produces light having three light components and said optics array separates said light so that two of said light components have the same polarization, which is different than the polarization of the third light component.

18. The converter of claim 17 wherein said three light components are blue, green, and red and said blue component and said green component have the same polarization, which is different than the polarization of said red component.

19. The converter of claim 1 wherein said optics array separates said two light components so that one of said components has s-polarization and the other light component has p-polarization.

20. A method for converting light comprising:

(a) producing a light beam that is nonpolarized and has at least two light components; and

(b) separating said light beam into at least one light component polarized differently than another light component, wherein substantially all of said light beam is transmitted.

21. The method of claim 20 wherein said light beam is first separated into a first polarized component having a first polarization and a second polarized component having a second polarization.

22. The method of claim 21, further comprising the step of separating the first polarized component into a first light component and a second light component and changing the polarization of the first light component, and the step of separating the second polarized component spectrally into said first light component and said second light component and changing the polarization of the second light component, so that said first light component has said second polarization, and said second light component has said first polarization.

23. The method of claim 20 wherein said light beam is comprised of a red component, a blue component and a green component, and said light is separated so that said blue component and said green component have the same polarization, which is different than the polarization of said red component.

24. The method of claim 20 wherein said light beam is separated so that one of said light components has s-polarization and the other light component has p-polarization.

25. A projection display system using polarized light comprising:

(a) a light source for generating a light beam having at least two light components, wherein said light components are polarized and at least one of said light components is polarized differently than another of said light components;

(b) a projection system having plural polarizing beam splitters and dichroic filters therein, wherein each polarizing beam splitter and dichroic filter reflects at least one of said light components and transmits at least another of said light components and a plurality of LCD panels, each LCD panel generating a light-component-specific image associated with one of said light components; and

(c) a projection lens for projecting an image combined from the light-component-specific images from the LCDs.

26. The system of claim 25 wherein said light source includes a lamp and a filter stack having a cholesteric color filter mechanism located between said lamp and said projection system for pre-filtering said light beam to transmit red p-polarized light, green s-polarized light and blue s-polarized light.

27. The system of claim 25 wherein said light source includes a polarization converter for pre-filtering said light beam.

28. The system of claim 25 wherein said polarizing beam splitters are arranged in a substantially straight line in said projection system, and wherein said dichroic filters are arranged in a substantially straight line in said projection system, and wherein said dichroic filters are normal to said polarizing beam splitters and arranged to intersect adjacent a mid-point of said substantially straight lines.

29. The system of claim 28 wherein said light beam from said light source impinges on a blue-transmitting dichroic filter at substantially 45 degrees, then impinges on a polarizing beam splitter at substantially 45 degrees, then impinges on an LCD panel having said light-component-specific image displayed thereon, substantially normal thereto, and is reflected therefrom carrying a color image component, then impinges a polarizing beam splitter at substantially 45 degrees, then impinges a blue-reflecting dichroic filter at substantially 45 degrees prior to transmitting said projection lens.

30. The system of claim 28 wherein said light beam from said light source impinges on a blue-transmitting dichroic filter at substantially 45 degrees, then impinges on a polarizing beam splitter at substantially 45 degrees, then impinges on an LCD panel having said light-component-specific image displayed thereon, substantially normal thereto, and is reflected therefrom carrying a color image component, then impinges a polarizing beam splitter at substantially 45 degrees, then impinges a blue-transmitting dichroic filter at substantially 45 degrees prior to transmitting said projection lens.

31. The system of claim 25 wherein said light source includes a lamp for generating said light beam and a pre-filtering illumination mechanism located between said lamp and said projection system for pre-filtering said light beam to provide a red p-polarized light component to said projection system, wherein said pre-filtering illuminating mechanism includes:

a red-transmitting dichroic filter, a pair of polarizing beam splitters, a pair of light absorbing stops, a half-wave plate, and a red-reflecting dichroic filter;

wherein said light beam impinges said red-transmitting dichroic filter, wherein said light beam is split into a reflected red light component and transmitted green light and blue light components; said reflected green and blue light components impinge on a polarizing beam splitter, which reflects a green s-polarized light component and said blue light component, wherein said green s-polarized light component and said blue light component impinge said red-reflecting dichroic filter, wich transmits said green s-polarized light component and a blue s-polarized light component to said projection system; and

wherein said reflected red light component impinges another polarizing beam splitter, which transmits a red s-polarized light component through said half-wave plate, which changes said red s-polarized light component to a red p-polarized light component, which red p-polarized light component impinges sand red-reflecting dichroic filter and is reflected to said projection system.

32. A projection display system using polarized light comprising:

(a) a light source for generating a light beam having at least three light components, wherein one of said light components is

p-polarized and two of said light components are s-polarized.

(b) a projection system having plural polarizing beam splitters and dichroic filters therein, wherein each polarizing beam splitter and dichroic filter reflects one of said light components and transmits another of said light components and LCD panels, each LCD panel generating a light-component-specific image associated with each light component, wherein said polarizing beam splitters and said dichroic filters are arranged in a substantially X-shaped configuration, wherein said dichroic filters are normal to said polarizing beam splitters and arranged to intersect adjacent an edge thereof; and

(c) a projection lens for projecting an image combined from the light-component-specific images from the LCDs.

33. The system of claim 32 wherein said light source includes a lamp and a filter stack having a cholesteric color filter mechanism located between said lamp and said projection system for pre-filtering said light beam.

34. The system of claim 32 wherein said light source includes a polarization converter for pre-filtering said light beam.

35. The system of claim 32 wherein said light beam from said light source impinges on a blue-transmitting dichroic filter at substantially 45 degrees, then impinges on a polarizing beam splitter at substantially 45 degrees, then impinges on an LCD panel having said light-component-specific image displayed

thereon, substantially normal thereto, and is reflected therefrom carrying a color image component, then impinges a polarizing beam splitter at substantially 45 degrees, then impinges a blue-reflecting dichroic filter at substantially 45 degrees prior to transmitting said projection lens.

36. The system of claim 32 wherein said light beam from said light source impinges on a blue-transmitting dichroic filter at substantially 45 degrees, then impinges on a polarizing beam splitter at substantially 45 degrees, then impinges on an LCD panel having said light-component-specific image displayed thereon, substantially normal thereto, and is reflected therefrom carrying a color image component, then impinges a polarizing beam splitter at substantially 45 degrees, then impinges a blue-reflecting dichroic filter at substantially 45 degrees prior to transmitting said projection lens.

37. The system of claim 32 wherein said light source includes a lamp for generating said light beam and a pre-filtering illumination mechanism located between said lamp and said projection system for pre-filtering said light beam to provide a red p-polarized light component, a green s-polarized light component and a blue s-polarized light component to said projection system, wherein said pre-filtering illumination mechanism includes:

a red-transmitting dichroic filter, a pair of polarizing beam splitters, a pair of light absorbing stops, a half-wave plate, and a red-reflecting dichroic filter;

wherein said light beam impinges said red-transmitting dichroic filter, wherein said light beam is split into a reflected red light component and transmitted green light and blue light components; said reflected

green and blue light components impinge on a polarizing beam splitter, which reflects a green s-polarized light component and said blue light component, wherein said green s-polarized light component and said blue light component impinge said red-reflecting dichroic filter, which transmits said green s-polarized light component and a blue s-polarized light component to said projection system; and

wherein said reflected red light component impinges another polarizing beam splitter, which transmits a red s-polarized light component through said half-wave plate, which changes said red s-polarized light component to a red p-polarized light component, which red p-polarized light component impinges said red-reflecting dichroic filter and is reflected to said projection system.

38. A projection display system using polarized light, comprising:

(a) a light source for generating a light beam having at least two light components, wherein said light components are polarized and at least one of said light components is polarized differently than another of said light components;

(b) a projection system having a plurality of polarized light modulators, each modulator generating a light-component-specific image associated with one of said light components; and

(c) a projection lens for projecting an image combined from the light-component-specific images from said modulators.

39. The system of claim 38 wherein said light source includes a lamp and a filter stack having a cholesteric color filter mechanism located between said lamp and said projection system for pre-filtering said light beam to transmit red p-polarized light, green s-polarized light and blue s-polarized light.

40. The system of claim 38 wherein said light source includes a polarization converter.

41. The system of claim 40 wherein said polarization converter transmits substantially all of said light beam.

42. The system of claim 40 wherein said light source has a lamp defining an initial étendue, and said polarization converter has an étendue no greater than twice said initial étendue.

43. The system of claim 40 wherein said polarization converter has a first dichroic filter and a second filter complimentary to said first dichroic filter, and wherein each dichroic filter is sandwiched between two quarter waveplates.

44. The system of claim 40 wherein said polarization converter includes two polarizing beam splitters.

45. The system of claim 40 wherein said polarization converter further comprises a plurality of light input ports.

46. The system of claim 43 wherein said polarization converter further includes at least two polarizing beam splitters.